Public Health Watch

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"One of the most critical components of the public health response to a chemical weapon terrorist attack is the capability of state and local health agencies. Personnel working at state and local public health institutions will be among the first to respond to any act of terrorism..."

Richard Jackson, MD, MPH, Director, National Center for Environmental Health in Official Statement to the Subcommittee on Labor, Health and Human Services, and Education Committee on Appropriations, U.S. Senate, June 2, 1998

Editor's Note:

The following article on chemical agents is the third in a series of articles dealing with those agents most likely to be used in a weaponized form as a terrorist agent.

Bioterrorism Update: Chemical Agents

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Division of Notifiable Disease /Immunization Promotion

A multitude of chemical agents could be used as a weapon. A chemical attack brings with it specific concerns that are not an issue when dealing with biological agents. Should such an event occur, there would be little time to react. It is essential that those who might be called upon to care for victims of a chemical exposure become familiar with the various agents that are most likely to be used and learn what to expect in dealing with a chemical event. This article will attempt to address several issues of concern and outline characteristics of the most likely chemical agents.

History of Chemical Warfare

Smoke was possibly the first chemical agent utililized in battle. Its use by the Chinese dates back to the year 1000 BC. It was used during the Peloponnesian War by the Spartans to overtake an Athenian fort. In 673 AD, a Syrian named Callinicus developed Greek Fire, which floated on water and was said to be impossible to extinguish. It became a key weapon in naval warfare and its use was greatly feared. Its impact on seventh century warfare has been likened to the modern day introduction of nuclear weapons.[1] Exactly how Greek Fire was made is unknown and its composition remains a mystery.

It was in the 18th century that ethical questions regarding the use of chemical weapons arose. The British government rejected a proposal to use sulfur as a weapon during the Crimean War. In 1854, a proposal by British chemist Lyon Playfair to use cyanide was also deemed unacceptable by the British War Office. Playfair responded:

There was no sense in this objection. It is considered a legitimate mode of warfare to fill shells with molten metal which scatters among the enemy, and produced the most frightful modes of death. Why a poisonous vapor which would kill men without suffering is to be considered illegitimate warfare is incomprehensible. War is destruction, and the more destructive it can be made with the least suffering the sooner will be ended that barbarous method of protecting national rights. No doubt in time chemistry will be used to lessen the suffering of combatants, and even of criminals condemned to death.[2]

Similar concerns surfaced during the American Civil War when the use of chlorine and chloroform against the Confederacy was suggested.[2] A plan devised by Napoleon III to dip bayonets in cyanide during the Franco-Prussian War is another that was never implemented.[3]

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In This Issue:

World War I ushered in a new era in chemical warfare. The Germans, French, and English all experimented with chemical agents, and several unsuccessful attempts were made on the battlefield. It was the Germans who carried out the first successful chemical gas attack. In 1914, Fritz Haber developed chemical cylinders for dispersion replacing the use of artillery shells for this purpose. The following year, he personally supervised an attack at Ypres, Belgium in which chlorine gas was deployed against French and Algerian troops. The Allied troops either retreated or were killed in this attack which they knew was coming. Because of earlier gas attack failures on both sides, neither the Germans nor the Allies had any idea of the damage that these gas cylinders could cause. The Germans themselves were unprepared for their success and failed to take advantage of the significant gap created in the Allied line, which was quickly filled in with fresh troops.[2] Fritz Haber is now known as the father of chemical warfare.[4]

Following the attack at Ypres, a frenzy of activity began on both sides. Research was directed at developing new chemical agents, more effective dissemination devices, and protective gear. A number of tearing and pulmonary agents were widely used, and it became standard for soldiers to carry some sort of gas mask.[2] In 1917, the Germans first used mustard gas which was frighteningly different from previously used chemical agents. Their goal was to circumvent the protection provided by the gas mask, and they were hideously successful. Following a latent period in which there are no symptoms, mustard causes painful blisters on any exposed skin. It may remain in an area or on an object for days thus extending the potential exposure period. Germany had again changed the nature of chemical warfare.[3]

In the late 1930's, German chemist Gerhard Schrader developed the first two nerve agents, tabun and sarin. Although major stores of these agents, as well as phosgene and mustard, were weaponized, they were never used during World War II. Adolf Hitler had been a victim of chemical agents in World War I, and he never approved their use for battle in World War II, although cyanide was used in concentration camps. Rumors regarding different countries' chemical weapons stores were rampant at this time and may have been one reason that there was no large-scale use of chemicals on the battle field. However, in 1943 Germany bombed an American ship in Bari Harbor, Italy which contained mustard bombs. Sailors floating in the water suffered ingestion and skin exposure, while civilians suffered inhalation exposure. Over 600 people were killed.[3]

The use of chemical weapons in warfare continued after World War II. There are reports of alleged use by Egypt, the Soviet Union, Iran, and Iraq from the 1960s to the 1990s.[3] A new threat surfaced in 1994 when a Japanese religious cult, Aum Shinrikyo, released sarin gas in a residential neighborhood, killing 7 people and injuring 500. The following year, this same group released sarin in the Tokyo subway. Over 5,500 people were affected, 12 of whom died. This was the first major incident of chemical terrorism off the battlefield, and it gained world-wide attention.[2] In 1996, the Nunn-Luger-Domenici Act was passed by Congress. This legislation provided funding for antiterrorism training in cities throughout the nation.[2]

Types of Chemical Agents

Chemical weapons are classified according to the symptoms they produce. They may be delivered as gas, vapor, or aerosolized particles. Exposure may be through inhalation, ingestion, or absorption through the skin. Some agents can be delivered in more than one way. Vapors, for example, liquefy at moderate temperatures and exposure could occur by all three routes. The most common route of exposure of weaponized chemicals is inhalation, with the exception being the blister agents. Unlike biological agents, chemicals generally cause symptoms immediately and detection of an event is not delayed.

Pulmonary agents cause respiratory symptoms and pulmonary edema. Exposure is through inhalation and severity of symptoms depends on the extent of exposure. Damage may occur by interference with oxygen transport or by physical damage to the respiratory tract.

Nerve agents are the deadliest class of chemical weapons and are usually delivered as vapors. They work quickly and can cause death in minutes. The classic symptom of nerve gas is the production of copious secretions. Drooling, tearing of the eyes, and sweating along with miosis are seen. If liquid gets on the skin, localized sweating will occur.

Blister agents burn the skin and cause the formation of raised vesicles. They are sometimes called vesicants. Because they are liquid, they can also be inhaled or ingested and may damage the airways and other internal organs. Mustard, the first blister agent ever used in battle, caused more casualties in World War I than all other chemicals combined.

Incapacitating agents are used to temporarily disable a person without causing death. These chemicals typically cause behavioral changes and symptoms that are the opposite of those caused by nerve agents. They are delivered as aerosolized solids or mixed in liquid solution.

The table on page three outlines very basic information about a variety of agents that are likely to be used in a chemical event. There are many more. Additional information is available at www.bt.cdc.gov.

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Chemical Agents Likely To Be Used In a Terrorist Event[6]

Agent	Type	Symptoms	Treatment	Characteristics
BZ	Incapacitating Aerosolized solid	❖ Mydriasis, dry mouth, dry skin, hallucinations, poor concentration, illusions	❖ Physostigmine ❖ Supportive Care	Latent period of 30 minutes to 24 hours; odorless and colorless
Chlorine	Pulmonary Gas	❖ Inhalation: shortness of breath, tightness in chest, cyanosis, low blood pressure, hemoptysis ❖ Ingestion: fever, abdominal pain, hematemesis, swollen throat, low blood pressure	❖ Inhalation: fresh air, oxygen, ventilation if needed ❖ Gastrointestinal: fluids, Milk of Magnesia, treat symptoms ❖ Eyes: flush with water for 15 minutes	Greenish-yellow gas with strong, offensive odor
Cyanide	Pulmonary Vapor	❖ Small exposure: hyperpnea, headache, weakness dizziness, nausea, anxiety ❖ Large exposure: seizures, respiratory & cardiac arrest	❖ Oxygen ❖ Antidote: IV sodium nitrite & sodium thiosulfate	Scent of bitter almonds; a specific gene is required to smell cyanide
Lewisite	Blister Liquid	❖ Immediate: Pain or irritation of skin & mucous membranes ❖ Later: Erythema, blisters, and airway damage	❖ Immediate decontamination ❖ Symptomatic treatment ❖ Antidote: British Anti-Lewisite (BAL)	Clear, oily liquid; scent of geraniums
Mustard	Blister Liquid	❖ Skin: blisters & erythema ❖ Eyes: pain, irritation, conjunctivitis, corneal opacity ❖ Inhalation: respiratory symptoms, airway damage	❖ Immediate decontamination ❖ Supportive ❖ No specific therapy	Latent period of 2-12 hours; oily liquid
Phosgene	Pulmonary Vapor	❖ Eye irritation, dyspnea, tightness in chest, delayed pulmonary edema	❖ Immediate decontamination ❖ Oxygen ❖ Supportive	Odor of newly mown hay or freshly cut grass
Sarin and Tabun	Nerve Vapor	❖ Miosis, blurred vision, increased secretions, rhinorrhea, nausea and vomiting, dyspnea, convulsions, flaccid paralysis	❖ Atropine ❖ Pralidoxime chloride ❖ Diazepam ❖ Ventilation if needed	Sarin: colorless, odorless liquid Tabun: brownish colored liquid

Decontamination

Decontamination is the removal of a chemical substance and can be accomplished by physical means or by neutralization. This procedure is necessary when contamination with a liquid or a solid occurs. If a vapor exposure occurs, removal from the affected area is sufficient.[3] Decontamination prevents secondary contamination of those assisting the victim as well as

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contamination of the patient's surroundings. Skin decontamination is the top priority, but eye and wound decontamination may also be necessary.

It is imperative that decontamination begin as soon as possible in order to minimize absorption into the skin and to decrease the amount to be neutralized by chemical decontamination. Physical means are usually the first available. It might be as simple as scraping the agent off the skin with some sort of stick such as a tongue blade. Water provides physical removal of chemical agents and is usually readily available. Water may also lessen the potency of some chemicals by diluting them. Emergency responders in Nashville have a mobile decontamination unit that uses water and can be taken to the scene of an event. Early decontamination is crucial and may be the difference between survival and death.

There are a number of products available that will deactivate chemical agents. One of the original means of decontamination was hypochlorite, which is still in use today. A 0.5% hypochlorite solution is a very effective liquid decontaminant. It is recommended for large or irregular areas and can be used on skin or soft tissue wounds.[3] It is not to be used in open chest or abdominal wounds. These should be irrigated and suctioned . Only water, saline, or eye solutions should be used to flush the eyes.

Another decontamination product is the M291 Kit, a dry decontamination agent used by the U.S. military.[5] The kit utilizes a black resin pad that fits over the hand. A soldier uses the pad for physical removal of a substance. The pad leaves behind a black powder as it is rubbed across the skin. This powder then acts to neutralize the remaining agent.

Protective Equipment

Anyone who comes in contact with a contaminated patient must wear protective clothing. To prevent inhalation and protect the eyes some type of mask is necessary. Most modern protective masks contain filters to remove an agent from inhaled air or to neutralize it. These masks are very uncomfortable and some persons cannot tolerate wearing them for more than a few minutes. Communication is also impaired. It is essential that a mask fit properly in order to provide protection. Masks should receive regular maintenance checks according to the manufacturers instructions.

To protect the skin, a protective overgarment is required. Some are completely impermeable and offer total protection. Most overgarments work by absorbing a chemical before it reaches the skin. Regardless of the type used, overheating is a problem. The wearer should be well hydrated and must be trained to remove the garment at the first sign of heat stress. Footwear and gloves are needed for full protection. These are bulky and seriously impair the ability to perform many tasks. Extensive training is necessary before using this sophisticated equipment.

Conclusion

A chemical event could be an accident or a deliberate attack. The threat is very real. It is frightening to imagine the number of people who might be affected in such a situation. Quick, decisive action is crucial in order to minimize injury and death. The information in this article serves as a basic introduction to chemical weapons. Those interested in learning more are urged to do further research. There is a wealth of information available, and the more we learn the better prepared we will be to deal with a chemical event.

References

[1] "Greek Fire." Available at http://www.greece.org/projects/Romiosini/greek_fire.html. Accessed on March 18, 2002.

[2] Smart, Jeffery K. "History of Chemical and Biological Warfare: An American Perspective." Medical Aspects of Chemical and Biological Warfare. Washington, DC: Office of the Surgeon General. 1997.

[3] U.S. Army Medical Research Institute of Chemical Defense. Medical Management of Chemical Casualties Handbook. Third edition. Aberdeen Proving Ground, MD. July 2000.

[4] "A Short History of Chemical Warfare During World War I. Available at http://www.mitretek.org/mission/envene/chemical/history/ww1.html. Accessed on March 19, 2002.

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Children's Special Services Offers Free Conference

WHO: Children's Special Services of Davidson County

WHEN: Friday, May 3rd, 2002 from 8:30 a.m. - 3:00 p.m.

WHAT: Free, 1 - day Conference "Let the Circle Be Unbroken"

WHERE: Nashville Public Library, Main Branch, Conference Center

WHY: To provide interested families and professionals current information on issues related to children with special health care needs.

For more information, contact Sheila McCloskey at 615-340-5697.

New Vaccine Surveillance Network Targets Davidson County

Kathryn M. Edwards, M.D., Professor of Pediatrics Vanderbilt University

The New Vaccine Surveillance Network (NVSN) has been established at Vanderbilt University in the Division of Pediatric Infectious Diseases and the Department of Preventive Medicine. This network is supported by the Centers for Disease Control and Prevention to conduct active surveillance of potentially vaccine preventable diseases. The network also assesses the impact of new vaccine policies on the overall vaccination program. One project supported by NVSN is year-round surveillance for viral respiratory infections in Davidson County children age <5 years admitted to Summit, Nashville General, and Vanderbilt Hospitals. Similar surveillance is being conducted in the Rochester, NY area. After obtaining informed consent, parents are interviewed for information about underlying medical conditions, other risk factors, and flu vaccination status. Nasal and pharyngeal swabs are collected for viral culture and PCR identification.

By the end of the first year of surveillance (8/31/01), 444 eligible Davidson County children hospitalized with an acute respiratory infection were screened and 324 (72.9%) were enrolled. Of the children enrolled, 31% had a virus identified including 3% influenza, 19% Respiratory Syncytial Virus (RSV), 5% parainfluenza, and 4% other viruses. Admissions for viral respiratory illness were highest in children age <1 year. For every 1,000 children in Davidson County aged <1 year, there were 12 admitted for RSV, 2 for influenza, and 3 for parainfluenza.

During the past month, RSV, adenovirus, enterovirus, and influenza A viruses have been identified. Periodic updates will be available on the viruses isolated in these children and other projects planned for children in Davidson County, TN.

For more information pertaining to the Vaccine Surveillance Network contact Dr. Kathryn Edwards at 615-322-2250.

Antibiotics Becoming Less Effective Against New Superbacteria

Katie Garman, M.P.H., C.H.E.S., Appropriate Antibiotic Use Coordinator, Tennessee Department of Health

For over half a century, doctors have relied on antibiotics to treat many infections. When first introduced in the 1940s, it was thought they would be able to fight against bacterial infections forever. These "miracle drugs" have allowed us all to live longer and healthier lives. However, many bacteria that were easily treated by antibiotics in the past are now unaffected by those drugs, largely because of misuse and overuse of antibiotics.

The Centers for Disease Control and Prevention (CDC) estimates that over 50 million unnecessary prescriptions of antibiotics are written each year. Why are so many antibiotics being prescribed? Many people do not realize that antibiotics only fight infections caused by bacteria, but they are not useful in treating infections caused by a virus—like the common cold or the flu. Patients often pressure their doctors for antibiotics for themselves or their sick children, and sometimes doctors grant this request so patients will leave satisfied. In addition, misuse often occurs because people "save" some of an antibiotic for the next time they get sick or take an antibiotic prescribed for someone else.

According to Dr. Allen Craig, State Epidemiologist, "We must begin to curb the inappropriate use of antibiotics, or bacteria will eventually become impervious to even the strongest drugs. If that happens, antibiotics will become less and less effective and it will become more difficult to treat common bacterial infections."

How do these tough, drug-resistant strains of bacteria develop? By taking antibiotics when not needed, people can increase their risk of having resistant bacteria when they do get sick. Everyone has bacteria living naturally in their bodies. When antibiotics are taken for a viral infection, these normal bacteria are exposed to antibiotics. This exposure can kill off these naturally occurring bacteria while antibiotic-resistant organisms survive, becoming a kind of "superbacteria."

The CDC estimates that each year, *Streptococcus pneumoniae* infections cause 100,000 – 135,000 hospitalizations for pneumonia, 7 million ear infections, and over 60,000 other serious infections, including 3,300 cases of

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National Public Health Week
April 1 - 7, 2002
"Healthy People In Healthy Communities"

The American Public Health Association chairs the National Public Health Week Steering Committee, a group of over 30 state and national organizations working to promote public health through the annual national celebration of public health practice and accomplishment. National Public Health Week is an opportunity to recognize the contributions of public health to the nation's well-being.

Did you know that in 1900 life expectancy was only 45 years? Did you know that in 1913 childbirth was the second leading cause of death (second to tuberculosis) for reproductive age women?

Over the past 50 years, the United States has achieved significant increases in life expectancy and reductions in the incidence of injury, disability, and disease. Of the additional years of life expectancy we have gained since the turn of the century, the public health approach is credited with the majority--approximately 25 years--of our improvements in our health status and expanded life expectancy.

Public health identifies and addresses patterns of disease, illness, and injury in populations. Public health is about ensuring healthy living and working environments. Through use of population-based strategies for disease and injury prevention, public health has contributed to the decline in illness and injury, including heart disease and stroke, tobacco-related diseases, infectious disease, and motor vehicle and workplace injuries.

Public health professionals have many success stories including the elimination of polio; the reduction in childhood blood lead levels; a decline in tooth decay due to fluoridated community water supplies; and the continued efforts to develop methods to immunize populations against infectious disease, maintain good nutritional standards, and provide good prenatal care for everyone.

The National Public Health Week theme--Healthy People in Healthy Communities--encompasses our goal to ensure that our homes and neighborhoods are places we all, especially children, can thrive.

Information taken from the National Public Health Association and the Centers for Disease Control and Prevention. Available at http://www.apha.org/news/press/nphw.htm and http://cdc.gov/od/nvpo/prtop10.htm. Accessed on March 25,2002.

"Public health is what we, as a society, do collectively to assure the conditions in which people can be healthy."

- The Institute of Medicine

May Is Mental Health Awareness Month

Wear Your Green Ribbon!

May is Mental Health Awareness Month and is the time to let everyone know that children's Mental Health Matters. Wearing a green ribbon throughout the month of May is a way to take positive action and bring awareness to children's mental health issues. *Green signifies new life, new growth, and new beginnings*. Call to order your **free** green ribbons today, so they can be worn during the month of May to show support for children with serious emotional disorders and their families. **To request your free green ribbons, call Tennessee Voices for Children and ask for Andrea. Call 615-269-7751 or toll-free 800-670-9882.**

Children's Mental Health Week Celebration – May 2002

One in five children have a diagnosable mental, emotional, or behavioral disorder. Seventy percent of children, however, do not receive appropriate mental health services. "Children's Mental Health Week Celebration" is May 5 through 11, 2002. "Children's Mental Health Week Celebration" will take place at the Nashville Zoo at Grassmere on Saturday, May 11, from 10:00 a.m. to 4:00 p.m. This annual event helps promote, celebrate, and raise awareness of children's mental health issues. Activities, entertainment, and information booths will be part of the festivities! Tennessee Voices for Children will be giving away **FREE ADMISSION** tickets to the zoo. Tickets are only valid for Saturday, May 11, 2002, no rain checks available. **For more information or to find out more about receiving free zoo tickets, please call Andrea at Tennessee Voices for Children at 615-269-7751 or toll-free 800-670-9882**.

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[5] Hurst, Charles G. "Decontamination." Medical Aspects of Chemical and Biological Warfare. Washington, DC: Office of the Surgeon General, 1997.

[6] Tennessee Emergency Management Agency. First Responder Chem-Bio Handbook. Version 1.5. Alexandria, VA. 1998.

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meningitis. In the early 1980s, penicillin could treat up to 99 percent of these cases. Today, in Tennessee, resistance rates for penicillin range from 35 to 50 percent.

Dr. Craig feels that "It is important that we develop educational campaigns to target both parents and clinicians concerning appropriate antibiotic use. Studies suggest that educational campaigns designed for both the public and physicians lead to fewer antibiotic prescriptions. Decreased antibiotic use leads to a decrease in resistance rates."

The Tennessee Department of Health's statewide Appropriate Antibiotic Use Campaign is gaining momentum and will focus on educating parents and health care providers about the importance of appropriate antibiotic use and risks of resistance. In the spring of 2002, the Department plans to bring together clinicians, parents, pharmaceutical companies, day care center staff, and other interested parties to form a coalition to determine how to get the message out about proper antibiotic use. If you are interested in joining the coalition, or would like more information about this topic, contact Katie Garman at 615-741-7247 or katie.garman@state.tn.us.

Reported cases of selected notifiable diseases for January/February 2002

Disease	Cases Reported in January/February		Cumulative Cases Reported through February	
	2001	2002	2001	2002
AIDS	48	28	48	28
Campylobacteriosis	5	2	5	2
Chlamydia	405	378	405	378
DRSP (Invasive drug-resistant *Streptococcus pneumoniae*	6	8	6	8
Escherichia coli 0157:H7	0	0	0	0
Giardiasis	2	1	2	1
Gonorrhea	303	225	303	225
Hepatitis A	5	6	5	6
Hepatitis B (acute)	2	0	2	0
Hepatitis B (perinatal)	4	1	4	1
HIV	75	55	75	55
Influenza-like Illness	127	50	127	50
Neisseria meningitidis disease	1	0	1	0
Salmonellosis	7	6	7	6
Shigellosis	1	2	1	2
Syphilis (primary and secondary)	16	14	16	14
Tuberculosis	12	5	12	5
VRE (Vancomycin-resistant enterococci)	11	7	11	7

To report a notifiable disease, please contact:

Sexually transmitted diseases: Pat Petty at 340-5647
AIDS/HIV: Mary Angel-Beckner at 340-5330
Hepatitis B: Denise Stratz at 340-2174
Tuberculosis: Diane Schmitt at 340-5650
Hepatitis C: Jennifer Blackmon at 340-5671
Vaccine-preventable diseases: Mary Fowler at 340-2168
All other notifiable diseases: Pam Trotter at 340-5632

Return Service Requested

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